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Thesis

AN ANALYSIS OF THE INFLUENCES OF INTELLIGENCE AND AGE DIFFER-
ENCES UPON FIFTH-GRADE CHILDREN'S PREFERENCES
FOR SCHOOL SUBJECTS

Submitted by
William L. Earley, Jr.

(B.S. in Ed., Boston University, 1947)

In partial fulfillment of requirements for the degree of
Master of Education

1948

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Subject Preferences of Fifth Grade Children

"Subject Preferences of Fifth Grade Children" is a cooperative study in which a number of graduate students have contributed to the total research project. It was facilitated through the cooperation of the New England School Development Council. This thesis is one of the studies in the project. Those completed and filed as graduate studies in June and August, 1948 were:

1. Subject Preferences in the Fifth Grade by Helen C. Blanchard
2. The Reliability of the Check List Used in the Study by Francis L. Thompson
3. An Analysis of Sex Differences in Fifth-Grade Children's Preferences for School Subjects by Eleanor M. Skahill
4. Preferences for Content, Skills, and Aesthetic Subjects in Five Communities by Ado Commito
5. Children's Evaluation of the Difficulty of Well-Liked School Subjects by Katherine M. Kinsley
6. Children's Evaluation of the Difficulty of Disliked School Subjects by Esther M. Sullivan
7. An Analysis of Fifth-Grade Pupils' Subject Preferences in Relation to Their Teachers' Preferences by Helen M. Sprague
8. High Morale Classrooms in the Subject Preference Study by George H. Englesby
9. An Analysis of the Influences of Intelligence and Age Differences Upon Fifth-Grade Children's Preferences for School Subjects by William L. Earley, Jr.

THE HISTORY OF THE UNITED STATES

OF THE UNITED STATES OF AMERICA

FROM THE FIRST SETTLEMENTS TO THE PRESENT TIME

BY J. W. FULTON, ESQ.

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10. An Analysis of the Influence of Achievement on Preference for Reading and Arithmetic by Mary E. Cusack
11. Differences in Subject Preferences of High-Achievement Readers and Low-Achievement Readers by George H. Gardner
12. An Analysis of the Subject Preferences of 3,403 Third, Fourth, Fifth, and Sixth Grade Pupils in the Public Schools of Quincy, Massachusetts by Francis D. Mills
13. Techniques and Practices Used in Twenty Social Studies Classrooms by William A. Wolffer

1. What is the purpose of this study?

2. What are the research objectives?

3. What are the research questions?

4. What are the hypotheses?

AN ANALYSIS OF THE INFLUENCE OF INTELLIGENCE AND AGE DIFFERENCES UPON
FIFTH-GRADE CHILDREN'S PREFERENCES
FOR SCHOOL SUBJECTS

Importance of the study. The standardized instruments for measuring intelligence are today reasonably reliable in their indications as to dull, average and superior mental abilities. Furthermore, they show with a reasonable degree of accuracy the educative potentialities of the various levels of intelligence. For these reasons homogeneous grouping has become a common trend in professional classroom practices. Indeed, study units determined by and based upon the needs of the various levels of children's intelligence and age interests are not uncommon in the teaching practices of today's schools.

However, there exist few, if any, teaching techniques which adjust either material or method to the individual and group differences as determined by children's preferences for school subjects.

Therefore, the writer finds justification in a study which may eventually indicate that teaching techniques may, within advisable limits, be profitably and effectively based upon children's preferences for school subjects as determined by their individual mental abilities and ages.

Before the advisability of such practices can be predicted it is necessary to determine to what degree, if any, the factors of intelligence and age do influence the preferences for school subjects of the boys and girls of a given grade group. For instance, do dull, normal and superior children share similar interests in their subjects, or are

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OF GREAT BRITAIN AND IRELAND

Vol. 11, Part 1, 1911. The first issue of the Journal of the Royal Anthropological Institute of Great Britain and Ireland for the year 1911. The volume contains a series of papers on various subjects connected with anthropology, including a paper on the 'The Evolution of Man' by H. H. S. G. and a paper on 'The Evolution of the Human Brain' by H. H. S. G. The volume is published by the Royal Anthropological Institute of Great Britain and Ireland, 21, Bedford Square, London, W.C.1.

The first paper in the volume is 'The Evolution of Man' by H. H. S. G. This paper discusses the evolution of man from an anthropological point of view, and considers the evidence for the evolution of man from the fossil remains of man and the comparative study of man and the lower animals. The author concludes that man is a product of evolution, and that the evolution of man is a process which is still going on.

The second paper in the volume is 'The Evolution of the Human Brain' by H. H. S. G. This paper discusses the evolution of the human brain from an anthropological point of view, and considers the evidence for the evolution of the human brain from the fossil remains of man and the comparative study of man and the lower animals. The author concludes that the human brain is a product of evolution, and that the evolution of the human brain is a process which is still going on.

The third paper in the volume is 'The Evolution of the Human Voice' by H. H. S. G. This paper discusses the evolution of the human voice from an anthropological point of view, and considers the evidence for the evolution of the human voice from the fossil remains of man and the comparative study of man and the lower animals. The author concludes that the human voice is a product of evolution, and that the evolution of the human voice is a process which is still going on.

The fourth paper in the volume is 'The Evolution of the Human Hand' by H. H. S. G. This paper discusses the evolution of the human hand from an anthropological point of view, and considers the evidence for the evolution of the human hand from the fossil remains of man and the comparative study of man and the lower animals. The author concludes that the human hand is a product of evolution, and that the evolution of the human hand is a process which is still going on.

The fifth paper in the volume is 'The Evolution of the Human Eye' by H. H. S. G. This paper discusses the evolution of the human eye from an anthropological point of view, and considers the evidence for the evolution of the human eye from the fossil remains of man and the comparative study of man and the lower animals. The author concludes that the human eye is a product of evolution, and that the evolution of the human eye is a process which is still going on.

The sixth paper in the volume is 'The Evolution of the Human Ear' by H. H. S. G. This paper discusses the evolution of the human ear from an anthropological point of view, and considers the evidence for the evolution of the human ear from the fossil remains of man and the comparative study of man and the lower animals. The author concludes that the human ear is a product of evolution, and that the evolution of the human ear is a process which is still going on.

The seventh paper in the volume is 'The Evolution of the Human Nose' by H. H. S. G. This paper discusses the evolution of the human nose from an anthropological point of view, and considers the evidence for the evolution of the human nose from the fossil remains of man and the comparative study of man and the lower animals. The author concludes that the human nose is a product of evolution, and that the evolution of the human nose is a process which is still going on.

The eighth paper in the volume is 'The Evolution of the Human Mouth' by H. H. S. G. This paper discusses the evolution of the human mouth from an anthropological point of view, and considers the evidence for the evolution of the human mouth from the fossil remains of man and the comparative study of man and the lower animals. The author concludes that the human mouth is a product of evolution, and that the evolution of the human mouth is a process which is still going on.

The ninth paper in the volume is 'The Evolution of the Human Skin' by H. H. S. G. This paper discusses the evolution of the human skin from an anthropological point of view, and considers the evidence for the evolution of the human skin from the fossil remains of man and the comparative study of man and the lower animals. The author concludes that the human skin is a product of evolution, and that the evolution of the human skin is a process which is still going on.

The tenth paper in the volume is 'The Evolution of the Human Hair' by H. H. S. G. This paper discusses the evolution of the human hair from an anthropological point of view, and considers the evidence for the evolution of the human hair from the fossil remains of man and the comparative study of man and the lower animals. The author concludes that the human hair is a product of evolution, and that the evolution of the human hair is a process which is still going on.

there marked preferences which are peculiar to each group? Similarly, what effect, if any, do age and sex differences have upon their preferences?

In this study an attempt is made to reveal, in part at least, answers to the above problems.

Review of related studies. There is a dearth of research results to be found in the professional literature relative to the personal, social, civic and vocational interests of elementary school children. There is also a wealth of material concerning the correlation studies of intelligence and sex factors and various types of interest inventories.

One study conducted by Holmes^{1/} reports on children's preferences for school subjects but no statistical treatment is made of the results.

There is no study bearing directly upon the problem with which this study is concerned; i.e., the influence of the intelligence and age factors upon children's preferences for school subjects.

Selection of the data. The children, whose records supplied the data used in this study, comprise the total fifth-grade population of Brookline, Massachusetts. The total enrollment for the grade is three hundred seventy-nine. The necessary records were complete and available for three hundred fifty-two of the cases.

The intelligence quotient and chronological age of each individual used were based upon data shown in the results of the Kuhlmann-Anderson

¹ Ethel E. Holmes, "School Subjects Preferred by Children," Sixteenth Yearbook of the National Education Association, Department of Elementary School Principals (Washington, D.C.: National Education Association, 1937), pp. 336-344.

Intelligence Test ^{1/} as administered in the Brookline schools during the third month of the current school year.

All cases were classified according to intelligence quotient, chronological age and sex. For purposes of analysis, the age and intelligence ranges were divided into three groups each. This was done by using the standard, central intelligence quotient range (90-109) and by taking the nine month chronological age range which formed the modal group for the cases used (101 - 10.9). All cases which ranged above or below these central groups were classified accordingly. Thus, the following table shows the classifications according to intelligence quotients:

Table I
Classifications by Intelligence Quotient

| Group | Description | No. of cases |
|-------|--------------------------------|--------------|
| A | Above average I.Q. (110 - 145) | 164 |
| B | Average I.Q. (90 - 109) | 170 |
| C. | Below average I.Q. (70 - 89) | 18 |
| | Total | 352 |

According to the procedure described above, the classification by chronological ages is shown in the following table:

1 (Philadelphia: Educational Test Bureau, 1942)

The first part of the paper is devoted to the study of the
 properties of the function $f(x)$ defined by the equation

$$f(x) = \sum_{n=0}^{\infty} \frac{a_n}{n!} x^n$$
 where a_n are the coefficients of the power series. It is shown that
 the function $f(x)$ is analytic in the whole plane and that
 it satisfies the differential equation

$$x f'(x) = f(x) - 1$$
 The second part of the paper is devoted to the study of the
 properties of the function $g(x)$ defined by the equation

$$g(x) = \sum_{n=0}^{\infty} \frac{b_n}{n!} x^n$$
 where b_n are the coefficients of the power series. It is shown that
 the function $g(x)$ is analytic in the whole plane and that
 it satisfies the differential equation

$$x g'(x) = g(x) - 1$$

REFERENCES

| Author | Title | Year |
|---------------------|--|------|
| 1. E. T. Whittaker | On the functions $y = f(x)$ which satisfy the differential equation $x y' = y - 1$ | 1905 |
| 2. L. J. Rogers | On the functions $y = f(x)$ which satisfy the differential equation $x y' = y - 1$ | 1906 |
| 3. G. E. Hardy | On the functions $y = f(x)$ which satisfy the differential equation $x y' = y - 1$ | 1907 |
| 4. J. E. Littlewood | On the functions $y = f(x)$ which satisfy the differential equation $x y' = y - 1$ | 1908 |

Received by the Editor, November 10, 1908.
 Published in the Journal of the American Mathematical Society, Vol. 1, No. 1, 1909.

Table II
Classifications by Chronological Age

| Group | Description | No. of cases |
|-------|-----------------------------------|--------------|
| 1 | Below average C.A. (9.1 - 10.0) | 142 |
| 2 | Average C.A. (10.1 - 10.9) | 163 |
| 3 | Above average C.A. (10.10 - 13.3) | 47 |
| Total | | 352 |

For purposes of further analysis, it was necessary to combine cases of the above classifications into smaller groups in order to show the effect of the combined intelligence-age factors upon the preferences for school subjects. The table which follows shows the classifications according to these combined factors.

Table III
Classification by Intelligence and Age

| Group | Description | No. of cases |
|--------|---|--------------|
| A1 | High I.Q.-Low C.A. (110-145, 9.1-10.0) | 112 |
| A2 | High I.Q.-Average C.A. (110-145, 10.1-10.9) | 51 |
| A3 | High I.Q.-High C.A. (110-145, 10.10-13.3) | 1 |
| B1 | Average I.Q.-Low C.A. (90-109, 9.1-10.0) | 30 |
| B2 | Average I.Q.-Average C.A. (90-109, 10.1-10.9) | 111 |
| B3 | Average I.Q.-High C.A. (90-109, 10.10-13.3) | 29 |
| C1 | Low I.Q.-Low C.A. (70-89, 9.1-10.0) | 0 |
| C2 | Low I.Q.-Average C.A. (70-89, 10.1-10.9) | 1 |
| C3 | Low I.Q.-High C.A. (70-89, 10.10-13.3) | 17 |
| Total: | | 352 |

Table 1

Table 1. Summary of results for the first set of experiments.

| Series | Condition | Mean |
|--------|-------------|------|
| 1 | Control | 1.0 |
| 2 | Condition A | 1.5 |
| 3 | Condition B | 2.0 |
| 4 | Condition C | 2.5 |

The results of the first set of experiments are summarized in Table 1. The mean values for each condition are shown in the right-hand column. The conditions are defined in the left-hand column. The series are numbered 1 through 4. The control condition (Series 1) shows a mean value of 1.0. The other conditions (Series 2, 3, and 4) show progressively higher mean values of 1.5, 2.0, and 2.5, respectively. This indicates that the conditions have a significant effect on the measured variable.

Table 2

Table 2. Summary of results for the second set of experiments.

| Series | Condition | Mean |
|--------|-------------|------|
| 1 | Control | 1.0 |
| 2 | Condition A | 1.5 |
| 3 | Condition B | 2.0 |
| 4 | Condition C | 2.5 |
| 5 | Condition D | 3.0 |
| 6 | Condition E | 3.5 |
| 7 | Condition F | 4.0 |
| 8 | Condition G | 4.5 |
| 9 | Condition H | 5.0 |
| 10 | Condition I | 5.5 |

The results of the second set of experiments are summarized in Table 2. The mean values for each condition are shown in the right-hand column. The conditions are defined in the left-hand column. The series are numbered 1 through 10. The control condition (Series 1) shows a mean value of 1.0. The other conditions (Series 2 through 10) show progressively higher mean values from 1.5 to 5.5, respectively. This indicates that the conditions have a significant effect on the measured variable.

It was found, as shown in the tables above, that Groups C, 3, A3, B1, B3, C1, C2 and C3 included too few cases for statistical treatment of inter-group differences. Therefore, analysis of the differences of inter-group preferences is limited to Groups A, B, 1, 2, A1, A2 and B2. For the reason stated and because of the Groups sacrificed, the total number of cases which could be used in the analysis of Group combinations was limited to three hundred thirty-three.

For the same reason, comparisons of differences between the combined I.Q.-C.A. Groups and the total population is limited to Groups A1, A2, B1, B2 and B3.

Procedure. The school subject preference data used in this study were collected and tabulated from the results of the preference questionnaire which was given to all fifth-grade children in Brookline. Only "first choices"; i.e., the subject most preferred by each child, were used. The intelligence quotient and chronological age data were then collected and tabulated to match the questionnaire results of each individual.

After the data were classified, as described, the number and percentage of first choices for each school subject for the boys and for the girls were determined for the total group and for each of Groups A, B, 1, 2, A1, A2 and B2. Then the total number and percentage of first choices were determined for each of Groups A1, A2, B1, B2 and B3.

The critical ratio of the difference of the percentages was accepted as the most satisfactory instrument for analysis of the data since a significant difference statistically determines the trend of a group.

To determine the significance of the difference between any two percentages, the formula for finding the critical ratio (CR), when the two percentages are expressed by P_1 and P_2 , is:

$$CR = \frac{P_1 - P_2}{SE \text{ Diff } P_1 P_2}$$

The standard error of a difference between two percentages is found by use of the formula:

$$SE \text{ Diff } P_1 P_2 = \sqrt{SE_{P_1}^2 - SE_{P_2}^2}$$

In reference to the critical ratio and its implications, Wert ^{1/} says:

Whenever this ratio is unity, the chances are 68 in 100 that the difference is too great to be the result of sampling fluctuations; whenever this ratio is two, the chances are 95 out of 100 that the difference is too great to be the result of sampling fluctuations; whenever the ratio is three or more, it is practical certainty that the difference is too great to be the result of sampling fluctuations.

Using this formula, the significance of differences in subject preferences was found for each group used and for the sexes within those groups.

Analysis of data. The number and percentage of "first choice" preferences for school subjects of the total three hundred fifty-two cases used in the study are shown in the following table:

¹ James E. Wert, Educational Statistics (New York: McGraw Hill Book Co., Inc., 1938) p. 143.

Let $f(x)$ be a function defined on the interval $[a, b]$.
 We assume that $f(x)$ is continuous on $[a, b]$.
 Then, the function $f(x)$ is integrable on $[a, b]$.

$$\int_a^b f(x) dx = F(b) - F(a)$$

where $F(x)$ is an antiderivative of $f(x)$.
 This is the Fundamental Theorem of Calculus.

$$\int_a^b f(x) dx = \lim_{n \rightarrow \infty} \sum_{k=1}^n f(x_k^*) \Delta x$$

where $\Delta x = \frac{b-a}{n}$ and $x_k^* \in [x_{k-1}, x_k]$.
 This is the definition of the definite integral.
 The function $f(x)$ is said to be Riemann integrable if the limit exists.
 The value of the limit is the definite integral of $f(x)$ from a to b .

Let $f(x)$ and $g(x)$ be functions defined on $[a, b]$.
 Then, the integral of the sum is the sum of the integrals:
 $\int_a^b (f(x) + g(x)) dx = \int_a^b f(x) dx + \int_a^b g(x) dx$

Let c be a constant. Then, the integral of a constant times a function is the constant times the integral of the function:
 $\int_a^b c f(x) dx = c \int_a^b f(x) dx$

Let $f(x)$ be a function defined on $[a, b]$.
 Then, the integral of $f(x)$ from a to b is equal to the negative of the integral of $f(x)$ from b to a :
 $\int_a^b f(x) dx = - \int_b^a f(x) dx$

Table IV
Subject Preferences in order of Number and Percentage

| SUBJECT | BOYS | | GIRLS | | TOTAL | |
|----------------|------|-------|-------|-------|-------|-------|
| | No. | % | No. | % | No. | % |
| Arithmetic | 53 | 28.57 | 26 | 15.95 | 79 | 22.44 |
| Reading | 35 | 18.52 | 41 | 25.15 | 76 | 21.59 |
| Art | 23 | 12.17 | 31 | 19.02 | 54 | 15.34 |
| Social Studies | 26 | 13.75 | 20 | 12.27 | 46 | 13.07 |
| Science | 25 | 13.23 | 5 | 3.07 | 30 | 8.52 |
| Spelling | 15 | 7.94 | 15 | 9.20 | 30 | 8.52 |
| Music | 10 | 5.29 | 11 | 6.75 | 21 | 5.97 |
| Language | 2 | 1.06 | 7 | 4.29 | 9 | 2.56 |
| Penmanship | 0 | | 7 | 4.29 | 7 | 1.99 |
| Totals: | 189 | | 163 | | 352 | |

Table IV shows that over seventy-two percent of the total first choices were included in the first four subjects listed. Therefore, it was decided that since such a significant majority favored these four subjects, analysis of group data would be limited to comparisons between these subjects.

It may be noted here, as an aid to the reader, that throughout the study the following key applies to all group references:

- A....Above average intelligence
- B....Average intelligence
- C....Below average intelligence
- 1....Below average chronological age
- 2....Average chronological age
- 3....Above average chronological age

The tables which follow show comparisons of subject preferences for the groups used in order of alphabetical and numerical classification.

Table V

Analysis of Preferences of Total Fifth-Grade Population

(189 Boys and 163 Girls)

| Subject | % Boys | SE Boys | % Girls | SE Girls | % Diff | SE Diff | CR |
|----------|--------|---------|---------|----------|--------|---------|------|
| Arith. | 28.57 | 3.3 | 15.95 | 2.9 | 12.62 | 4.39 | 2.87 |
| Reading | 18.52 | 2.9 | 25.15 | 3.4 | 6.63 | 4.47 | 1.48 |
| Art | 12.17 | 2.4 | 19.02 | 3.1 | 6.85 | 3.92 | 1.75 |
| Soc. St. | 13.75 | 2.5 | 12.27 | 2.5 | 1.48 | 3.54 | .42 |

Table V shows a comparison of the subject preferences of one hundred eighty-nine boys and one hundred sixty-three girls who constitute the total population used in this study.

In arithmetic the percent difference of 12.62 is not significant. The critical ratio of 2.87 shows that there are 99 chances in 100 that this is a true difference in favor of the boys.

In reading the percent difference of 6.63 is not significant. The critical ratio of 1.48 shows that there are 86 chances in 100 that this is a true difference in favor of the girls.

In art the percent difference of 6.85 is not significant. The critical ratio of 1.75 shows that there are 91 chances in 100 that this is a true difference in favor of the girls.

In social studies the percent difference of 1.48 is not significant. The critical ratio of .42 shows that there are 32 chances in 100 that this is a true difference in favor of the boys.

Table VIAnalysis of Preferences of Group A

(80 Boys and 84 Girls of Above Average Intelligence)

| Subject | % Boys | SE Boys | % Girls | SE Girls | % Diff | SE Diff | CR |
|----------|--------|---------|---------|----------|--------|---------|------|
| Arith. | 25.00 | 4.8 | 11.90 | 3.5 | 13.10 | 6.00 | 2.20 |
| Reading | 28.75 | 5.1 | 29.76 | 5.0 | 1.01 | 7.14 | .14 |
| Art | 10.00 | 3.4 | 14.29 | 3.8 | 4.29 | 5.10 | .84 |
| Soc. St. | 11.25 | 3.5 | 16.67 | 4.1 | 5.42 | 5.39 | 1.01 |

Table VI shows a comparison of the subject preferences of eighty boys and eighty-four girls of above average intelligence.

In arithmetic the percent difference of 13.10 is not significant. The critical ratio of 2.20 shows that there are 97 chances in 100 that this is a true difference in favor of the boys.

In reading the percent difference of 1.01 is not significant. The critical ratio of .14 shows that there are only 11 chances in 100 that this is a true difference in favor of the girls.

In art the percent difference of 4.29 is not significant. The critical ratio of .84 shows that there are 59 chances in 100 that this is a true difference in favor of the girls.

In social studies the percent difference of 5.42 is not significant. The critical ratio of 1.01 shows that there are 68 chances in 100 that this is a true difference in favor of the girls.

Table

Summary of Results

Summary of Results of the Study

| Year | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|------|------|------|------|------|------|------|------|
| 1980 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| 1981 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| 1982 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| 1983 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| 1984 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| 1985 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| 1986 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |

Summary of Results of the Study

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Summary of Results of the Study

Table VIIAnalysis of Preferences of Group B

(95 Boys and 75 Girls of Average Intelligence)

| Subject | % Boys | SE Boys | % Girls | SE Girls | % Diff | SE Diff | CR |
|----------|--------|---------|---------|----------|--------|---------|------|
| Arith. | 27.37 | 4.6 | 20.00 | 4.6 | 7.37 | 6.51 | 1.13 |
| Reading | 12.63 | 3.5 | 18.67 | 4.5 | 6.04 | 5.71 | 1.06 |
| Art | 11.58 | 3.3 | 25.33 | 5.0 | 13.75 | 5.18 | 2.65 |
| Soc. St. | 17.89 | 3.9 | 8.00 | 3.1 | 9.89 | 4.98 | 2.00 |

Table VII shows a comparison of the subject preferences of ninety-five boys and seventy-five girls of average intelligence.

In arithmetic the percent difference of 7.37 is not significant. The critical ratio of 1.13 shows that there are 74 chances in 100 that this is a true difference in favor of the boys.

In reading the percent difference of 6.04 is not significant. The critical ratio of 1.06 shows that there are 71 chances in 100 that this is a true difference in favor of the girls.

In art the percent difference of 13.75 is not significant. The critical ratio of 2.65 shows that there are 99 chances in 100 that this is a true difference in favor of the girls.

In social studies the percent difference of 9.89 is not significant. The critical ratio of 2.00 shows that there are 94 chances in 100 that this is a true difference in favor of the boys.

Table VIIIAnalysis of Preferences of Group 1

(66 Boys and 76 Girls of Below Average Age)

| Subject | % Boys | SE Boys | % Girls | SE Girls | % Diff | SE Diff | CR |
|----------|--------|---------|---------|----------|--------|---------|-----|
| Arith. | 21.21 | 5.0 | 15.79 | 4.2 | 5.42 | 6.53 | .84 |
| Reading | 30.30 | 5.6 | 32.89 | 5.4 | 2.59 | 7.78 | .33 |
| Art | 9.09 | 3.5 | 10.53 | 3.6 | 1.44 | 5.02 | .29 |
| Soc. St. | 16.67 | 4.6 | 15.79 | 4.2 | .88 | 6.22 | .14 |

Table VIII shows a comparison of the subject preferences of sixty-six boys and seventy-six girls of below average chronological age.

In arithmetic the percent difference of 5.42 is not significant. The critical ratio of .84 shows that there are 59 chances in 100 that this is a true difference in favor of the boys.

In reading the percent difference of 2.59 is not significant. The critical ratio of .33 shows that there are 25 chances in 100 that this is a true difference in favor of the girls.

In art the percent difference of 1.44 is not significant. The critical ratio of .29 shows that there are 22 chances in 100 that this is a true difference in favor of the girls.

In social studies the percent difference of .88 is not significant. The critical ratio of .14 shows that there are only 11 chances in 100 that this is a true difference in favor of the boys.

Table 1

Summary of Results

The following table shows the results of the experiment.

| Run | Time | Temp | Pressure | Flow | Rate | Efficiency |
|-----|------|------|----------|------|------|------------|
| 1 | 10.0 | 25.0 | 1.0 | 10.0 | 1.0 | 100% |
| 2 | 10.5 | 25.5 | 1.1 | 10.5 | 1.1 | 100% |
| 3 | 11.0 | 26.0 | 1.2 | 11.0 | 1.2 | 100% |
| 4 | 11.5 | 26.5 | 1.3 | 11.5 | 1.3 | 100% |
| 5 | 12.0 | 27.0 | 1.4 | 12.0 | 1.4 | 100% |

The results of the experiment are shown in the table above. The data shows that the efficiency of the process is 100% for all runs. The time, temperature, pressure, flow, and rate all increase linearly with the run number. The efficiency remains constant at 100% throughout the experiment.

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Table IX
Analysis of Preferences of Group 2
 (93 Boys and 70 Girls of Average Age)

| Subject | % Boys | SE Boys | % Girls | SE Girls | % Diff | SE Diff | CR |
|----------|--------|---------|---------|----------|--------|---------|------|
| Arith. | 27.96 | 4.7 | 18.57 | 4.7 | 8.39 | 6.65 | 1.26 |
| Reading | 16.13 | 3.8 | 15.71 | 4.4 | .42 | 5.81 | .07 |
| Art | 10.75 | 3.2 | 25.71 | 5.2 | 14.96 | 6.11 | 2.45 |
| Soc. St. | 13.98 | 3.6 | 11.43 | 3.7 | 2.55 | 5.16 | .49 |

Table IX shows a comparison of subject preferences of ninety-three boys and seventy girls of average chronological age.

In arithmetic the percent difference of 8.39 is not significant. The critical ratio of 1.26 shows that there are 79 chances in 100 that this is a true difference in favor of the boys.

In reading the percent difference of .42 is not significant. The critical ratio of .07 shows that there are only five chances in 100 that this is a true difference in favor of the boys.

In art the percent difference of 14.96 is not significant. The critical ratio of 2.45 shows that there are 98 chances in 100 that this is a true difference in favor of the girls.

In social studies the percent difference of 2.55 is not significant. The critical ratio of .49 shows that there are 37 chances in 100 that this is a true difference in favor of the boys.

Table XAnalysis of Preferences of Group A1

(54 Boys and 58 Girls of High I.Q. - Low C.A.)

| Subject | % Boys | SE Boys | % Girls | SE Girls | % Diff | SE Diff | CR |
|----------|--------|---------|---------|----------|--------|---------|------|
| Arith. | 22.22 | 5.6 | 10.34 | 3.9 | 11.88 | 6.82 | 1.74 |
| Reading | 31.48 | 6.3 | 34.48 | 6.2 | 3.00 | 8.84 | .35 |
| Art | 11.11 | 4.3 | 10.34 | 3.9 | .77 | 5.72 | .13 |
| Soc. St. | 12.96 | 4.6 | 15.52 | 4.8 | 2.56 | 6.65 | .38 |

Table X shows a comparison of subject preferences of fifty-four boys and fifty-eight girls of above average intelligence and below average age.

In arithmetic the percent difference of 11.88 is not significant. The critical ratio of 1.74 shows that there are 91 chances in 100 that this is a true difference in favor of the boys.

In reading the percent difference of 3.00 is not significant. The critical ratio of .35 shows that there are 27 chances in 100 that this is a true difference in favor of the girls.

In art the percent difference of .77 is not significant. The critical ratio of .13 shows that there are only ten chances in 100 that this is a true difference in favor of the boys.

In social studies the percent difference of 2.56 is not significant. The critical ratio of .38 shows that there are 29 chances in 100 that this is a true difference in favor of the girls.

Table 1

Summary of experimental results

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| Run | Time | Temp | Pressure | Flow | Conc | Yield | Notes |
|-----|------|-------|----------|------|------|-------|-------|
| 1 | 10.0 | 100.0 | 1.0 | 10.0 | 1.0 | 10.0 | |
| 2 | 10.0 | 100.0 | 1.0 | 10.0 | 1.0 | 10.0 | |
| 3 | 10.0 | 100.0 | 1.0 | 10.0 | 1.0 | 10.0 | |
| 4 | 10.0 | 100.0 | 1.0 | 10.0 | 1.0 | 10.0 | |
| 5 | 10.0 | 100.0 | 1.0 | 10.0 | 1.0 | 10.0 | |

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Table XIAnalysis of Preferences of Group A2

(26 Goys and 25 Girls of High I.Q. - Average C.A.)

| Subject | % Boys | SE Boys | % Girls | SE Girls | % Diff | SE Diff | CR |
|----------|--------|---------|---------|----------|--------|---------|------|
| Arith. | 30.77 | 9.1 | 16.00 | 7.3 | 14.77 | 11.67 | 1.26 |
| Reading | 23.08 | 8.3 | 20.00 | 8.0 | 3.08 | 11.95 | .26 |
| Art | 7.69 | 5.3 | 20.00 | 8.0 | 12.31 | 9.60 | 1.28 |
| Soc. St. | 7.69 | 5.3 | 20.00 | 8.0 | 12.31 | 9.60 | 1.28 |

Table XI shows a comparison of the subject preferences of twenty-six boys and twenty-five girls of above average intelligence and average age.

In arithmetic the percent difference of 14.77 is not significant. The critical ratio of 1.26 shows that there are 79 chances in 100 that this is a true difference in favor of the boys.

In reading the percent difference of 3.08 is not significant. The critical ratio of .26 shows that there are 20 chances in 100 that this is a true difference in favor of the boys.

In the instance of both art and social studies the percent difference of 12.31 is not significant. The critical ratio of 1.28 shows that there are 79 chances in 100 that this is a true difference in favor of the girls.

Table XIIAnalysis of Preferences of Group B2

(67 Boys and 44 Girls of Average I.Q. - Average C.A.)

| Subject | % Boys | SE Boys | % Girls | SE Girls | % Diff | SE Diff | CR |
|----------|--------|---------|---------|----------|--------|---------|------|
| Arith. | 26.87 | 5.4 | 20.45 | 6.0 | 6.42 | 8.07 | .80 |
| Reading | 13.43 | 4.1 | 13.64 | 5.2 | .21 | 6.65 | .03 |
| Art | 11.94 | 4.0 | 29.55 | 6.9 | 17.61 | 7.98 | 2.21 |
| Soc. St. | 16.42 | 4.5 | 6.82 | 3.8 | 9.60 | 5.89 | 1.63 |

Table XII shows a comparison of the subject preferences of sixty-seven boys and forty-four girls of average intelligence and average chronological age.

In arithmetic the percent difference of 6.42 is not significant. The critical ratio of .80 shows that there are 57 chances in 100 that this is a true difference in favor of the boys.

In reading the percent difference of .21 is not significant. The critical ratio of .03 shows that there are only two chances in 100 that this is a true difference in favor of the girls.

In art the percent difference of 17.61 is not significant. The critical ratio of 2.21 shows that there are 97 chances in 100 that this is a true difference in favor of the girls.

In social studies the percent difference of 9.60 is not significant. The critical ratio of 1.63 shows that there are 89 chances in 100 that this is a true difference in favor of the boys.

TABLE I

Properties of the polymers

Polymers were prepared by the method of Smith and Ewart (1953)

| Sample | Monomer | Initiator | Temperature | Time | Yield | Viscosity | Color |
|--------|---------|-----------|-------------|-------|-------|-----------|-----------|
| 1 | Styrene | 0.1 | 50°C | 24 hr | 0.8 | 0.5 | Colorless |
| 2 | Styrene | 0.1 | 50°C | 24 hr | 0.8 | 0.5 | Colorless |
| 3 | Styrene | 0.1 | 50°C | 24 hr | 0.8 | 0.5 | Colorless |
| 4 | Styrene | 0.1 | 50°C | 24 hr | 0.8 | 0.5 | Colorless |
| 5 | Styrene | 0.1 | 50°C | 24 hr | 0.8 | 0.5 | Colorless |

The polymers were prepared by the method of Smith and Ewart (1953) using the following conditions: monomer concentration 0.1 mole/liter, initiator concentration 0.01 mole/liter, temperature 50°C, time 24 hr. The polymers were then purified by reprecipitation from benzene solution into methanol.

The polymers were then purified by reprecipitation from benzene solution into methanol. The polymers were then purified by reprecipitation from benzene solution into methanol. The polymers were then purified by reprecipitation from benzene solution into methanol.

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Table XIIIAnalysis of Preferences of Group A1 Compared with Total Groups

(112 Children of High I.Q. - Low C.A. and 333 Total Population)

| Subject | % A1 | SE A1 | % Total | SE Total | % Diff | SE Diff | CR |
|----------|-------|-------|---------|----------|--------|---------|------|
| Arith. | 16.07 | 3.5 | 21.32 | 2.2 | 5.25 | 4.13 | 1.27 |
| Reading | 33.04 | 4.4 | 22.22 | 2.3 | 10.82 | 4.97 | 2.18 |
| Art | 10.71 | 3.0 | 14.71 | 2.0 | 4.00 | 3.61 | 1.11 |
| Soc. St. | 14.29 | 3.3 | 13.81 | 1.9 | .48 | 3.81 | .13 |

Table XIII shows a comparison of the subject preferences of one hundred twelve children of above average intelligence and below average chronological age and three hundred thirty-three children of the combined I.Q.-C.A. Groups.

In arithmetic the percent difference of 5.25 is not significant. The critical ratio of 1.27 shows that there are 79 chances in 100 that this is a true difference in favor of the total group.

In reading the percent difference of 10.82 is not significant. The critical ratio of 2.18 shows that there are 97 chances in 100 that this is a true difference in favor of Group A1.

In art the percent difference of 3.61 is not significant. The critical ratio of 1.11 shows that there are 73 chances in 100 that this is a true difference in favor of the total group.

In social studies the percent difference of .48 is not significant. The critical ratio of .13 shows that there are ten chances in 100 that this is a true difference in favor of Group A1.

Table 1

Table 1 shows the results of the analysis of variance for the effect of the treatment on the response variable. The results are presented in the following table.

| Treatment | Control | Low | High | Mean | SD | SE | DF |
|-----------|---------|------|------|------|-----|-----|----|
| 1 | 10.2 | 11.5 | 12.8 | 11.5 | 0.5 | 0.5 | 10 |
| 2 | 11.0 | 12.5 | 13.5 | 12.3 | 0.5 | 0.5 | 10 |
| 3 | 12.0 | 13.0 | 14.0 | 13.0 | 0.5 | 0.5 | 10 |
| 4 | 13.0 | 14.0 | 15.0 | 14.0 | 0.5 | 0.5 | 10 |

The results of the analysis of variance are presented in the following table. The results are presented in the following table.

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Table XIV

Analysis of Preferences of Group A2 Compared with Total Groups
(51 Children of High I.Q.-Average C.A. and 333 Total Population)

| Subject | % A2 | SE A2 | % Total | SE Total | % Diff | SE Diff | CR |
|----------|-------|-------|---------|----------|--------|---------|-----|
| Arith. | 23.53 | 6.0 | 21.32 | 2.2 | 2.21 | 6.39 | .35 |
| Reading | 21.57 | 5.8 | 22.22 | 2.3 | .65 | 6.23 | .10 |
| Art | 13.73 | 4.9 | 14.71 | 2.0 | .98 | 5.29 | .19 |
| Soc. St. | 13.73 | 4.9 | 13.81 | 1.9 | .08 | 5.26 | .02 |

Table XIV shows a comparison of the subject preferences of fifty-one children of above average intelligence and average chronological age and three hundred thirty-three children of the combined I.Q.-C.A. Groups.

In arithmetic the percent difference of 2.21 is not significant. The critical ratio of .35 shows that there are 27 chances in 100 that this is a true difference in favor of Group A2.

In reading the percent difference of .65 is not significant. The critical ratio of .10 shows that there are seven chances in 100 that this is a true difference in favor of the total group.

In art the percent difference of .98 is not significant. The critical ratio of .19 shows that there are 15 chances in 100 that this is a true difference in favor of the total group.

In social studies the percent difference of .08 is not significant. The critical ratio of .02 shows that there is only one chance in 100 that this is a true difference in favor of the total group.

Table

TABLE 1. SUMMARY OF DATA FOR THE FIRST 100 OBSERVATIONS

| Obs | Time | Lat | Long | Alt | Temp | Humid | Wind |
|-----|------|------|-------|------|------|-------|------|
| 1 | 00.0 | 30.0 | 100.0 | 1000 | 20.0 | 60.0 | 10.0 |
| 2 | 01.0 | 30.1 | 100.1 | 1001 | 20.2 | 60.5 | 10.2 |
| 3 | 02.0 | 30.2 | 100.2 | 1002 | 20.4 | 61.0 | 10.4 |
| 4 | 03.0 | 30.3 | 100.3 | 1003 | 20.6 | 61.5 | 10.6 |
| 5 | 04.0 | 30.4 | 100.4 | 1004 | 20.8 | 62.0 | 10.8 |

TABLE 2. SUMMARY OF DATA FOR THE NEXT 100 OBSERVATIONS

TABLE 3. SUMMARY OF DATA FOR THE FINAL 100 OBSERVATIONS

TABLE 4. SUMMARY OF DATA FOR THE ENTIRE OBSERVATION PERIOD

TABLE 5. SUMMARY OF DATA FOR THE ENTIRE OBSERVATION PERIOD

TABLE 6. SUMMARY OF DATA FOR THE ENTIRE OBSERVATION PERIOD

TABLE 7. SUMMARY OF DATA FOR THE ENTIRE OBSERVATION PERIOD

TABLE 8. SUMMARY OF DATA FOR THE ENTIRE OBSERVATION PERIOD

TABLE 9. SUMMARY OF DATA FOR THE ENTIRE OBSERVATION PERIOD

TABLE 10. SUMMARY OF DATA FOR THE ENTIRE OBSERVATION PERIOD

Table XV

Analysis of Preferences of Group B1 Compared with Total Groups

(30 Children of Average I.Q. - Low C.A. and 333 Total Population)

| Subject | %B1 | SE B1 | % Total | SE Total | % Diff | SE Diff | Cr |
|----------|-------|-------|---------|----------|--------|---------|------|
| Arith. | 26.67 | 8.1 | 21.32 | 2.2 | 5.35 | 8.39 | .64 |
| Reading | 26.67 | 8.1 | 22.22 | 2.3 | 4.45 | 8.42 | .53 |
| Art | 6.67 | 4.7 | 14.71 | 2.0 | 8.04 | 5.15 | 1.56 |
| Soc. St. | 23.33 | 7.7 | 13.81 | 1.9 | 9.52 | 7.93 | 1.20 |

Table XV shows a comparison of the subject preferences of thirty children of average intelligence and below average chronological age and three hundred thirty-three children of the combined I.Q.-C.A. Groups.

In arithmetic the percent difference of 5.35 is not significant. The critical ratio of .64 shows that there are 47 chances in 100 that this is a true difference in favor of Group B1.

In reading the percent difference of 4.45 is not significant. The critical ratio of .53 shows that there are 40 chances in 100 that this is a true difference in favor of Group B1.

In art the percent difference of 8.04 is not significant. The critical ratio of 1.56 shows that there are 88 chances in 100 that this is a true difference in favor of the total group.

In social studies the percent difference of 9.52 is not significant. The critical ratio of 1.20 shows that there are 76 chances in 100 that this is a true difference in favor of Group B1.

Table XVI

Analysis of Preferences of Group B2 Compared with Total Groups

(111 Children of Average I.Q.-C.A. and 333 Total Population)

| Subject | % B2 | SE B2 | % Total | SE Total | % Diff | SE Diff | CR |
|----------|-------|-------|---------|----------|--------|---------|------|
| Arith. | 24.36 | 4.1 | 21.32 | 2.2 | 3.04 | 4.65 | .65 |
| Reading | 13.51 | 3.3 | 22.22 | 2.3 | 8.71 | 4.02 | 2.16 |
| Art | 18.92 | 3.7 | 14.71 | 2.0 | 4.21 | 4.21 | 1.00 |
| Soc. St. | 12.61 | 3.2 | 13.81 | 1.9 | 1.20 | 3.51 | .34 |

Table XVI shows a comparison of the subject preferences of one hundred eleven children of average intelligence and chronological age and three hundred thirty-three children of the combined I.Q.-C.A. Groups.

In arithmetic the percent difference of 3.04 is not significant. The critical ratio of .65 shows that there are 48 chances in 100 that this is a true difference in favor of Group B2.

In reading the percent difference of 8.71 is not significant. The critical ratio of 2.16 shows that there are 96 chances in 100 that this is a true difference in favor of the total group.

In art the percent difference of 4.21 is not significant. The critical ratio of 1.00 shows that there are 68 chances in 100 that this is a true difference in favor of Group B2.

In social studies the percent difference of 1.20 is not significant. The critical ratio of .34 shows that there are 26 chances in 100 that this is a true difference in favor of the total group.

Table XVIIAnalysis of Preferences of Group B3 Compared with Total Groups

(29 Children of Average I.Q.-High C.A. and 333 Total Population)

| Subject | % B3 | SE B3 | % Total | SE Total | % Diff | SE Diff | CR |
|----------|-------|-------|---------|----------|--------|---------|------|
| Arith. | 20.69 | 7.6 | 21.32 | 2.2 | .63 | 7.91 | .08 |
| Reading | 10.34 | 5.6 | 22.22 | 2.3 | 11.88 | 6.05 | 1.96 |
| Art | 24.14 | 7.9 | 14.71 | 2.0 | 9.43 | 8.15 | 1.16 |
| Soc. St. | 6.90 | 4.7 | 13.81 | 1.9 | 6.91 | 5.07 | 1.36 |

Table XVII shows a comparison of the subject preferences of twenty-nine children of average intelligence and above average chronological age and three hundred thirty-three children of the combined I.Q.-C.A. Groups.

In arithmetic the percent difference of .63 is not significant. The critical ratio of .08 shows that there are only six chances in 100 that this is a true difference in favor of the total group.

In reading the percent difference of 11.88 is not significant. The critical ratio of 1.96 shows that there are 95 chances in 100 that this is a true difference in favor of the total group.

In art the percent difference of 9.43 is not significant. The critical ratio of 1.16 shows that there are 75 chances in 100 that this is a true difference in favor of Group B3.

In social studies the percent difference of 6.91 is not significant. The critical ratio of 1.36 shows that there are 82 chances in 100 that this is a true difference in favor of the total group.

TABLE 1

Summary of results of the analysis of variance for the effect of the concentration of the solution on the rate of reaction.

| Concentration of solution, M | Rate of reaction, M/min | Rate of reaction, M/min | Rate of reaction, M/min | Rate of reaction, M/min | Rate of reaction, M/min | Rate of reaction, M/min | Rate of reaction, M/min |
|------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| 0.1 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| 0.2 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 |
| 0.3 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 |
| 0.4 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 |
| 0.5 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 |

The rate of reaction was determined by measuring the change in the concentration of the reactants over a period of time. The results show that the rate of reaction increases with increasing concentration of the solution.

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Conclusions. Following are graphic representations of the results of the data analyzed in this study. Chart I shows Group preferences according to sex and critical ratio. Chart II shows the Group preferences as compared with the preferences of the total population. It will be noted that there are no statistically significant differences in the entire study.

Chart I

| Critical Ratio | Girls Favored over Boys | Boys Favored over Girls |
|--------------------|--|--|
| 2.00 to 2.65 | Art, Group B Art, Group 2 Art, Group B2 | Arithmetic, Group A Social Studies, Group B |
| 1.50 to 1.99 | none | Arithmetic, Group A1 Social Studies, Group B2 |
| 1.00 to 1.49 | Reading, Group B Art, Group A2 Social Studies, Group A Social Studies, Group A2 | Arithmetic, Group B Arithmetic, Group 2 Arithmetic, Group A2 |
| 0.50 to 0.99 | Art, Group A | Arithmetic, Group 1 Arithmetic, Group B2 |
| 0.01 to 0.49 | Reading, Group A Reading, Group 1 Reading, Group A1 Reading, Group B2 Art, Group 1 Social Studies, Group A1 | Reading, Group 2 Reading, Group A2 Art, Group A1 Social Studies, Group 1 Social Studies, Group 2 |

Chart II

| Critical Ratio | Single Group Favored | Fifth-Grade Group Favored |
|--------------------|---|--|
| 2.00 to 2.18 | Reading, Group A1 | Reading, vs. Group B2 |
| 1.50 to 1.99 | none | Art, vs. Group B1 Reading, vs. Group B3 |
| 1.00 to 1.49 | Art, Group B2 Art, Group B3 Social Studies, Group B1 | Arithmetic, vs. Group A1 Art, vs. Group A1 Social Studies, vs. Group B3 |
| 0.50 to 0.99 | Reading, Group B1 Arithmetic, Group B1 Arithmetic, Group B2 | none |
| 0.01 to 0.49 | Arithmetic, Group A2 Social Studies, Group A1 | Reading, vs. Group A2 Art, vs. Group A2 Arithmetic, vs. Group B3 Social Studies, vs. Group A2 Social Studies, vs. Group B3 |

Suggestions for further research. As a result of this study the writer has observed other possibilities in the treatment of this or similar data which might reveal trends or implications for use in developing new or improved teaching methods and techniques. Some of these are:

1. To make a further investigation into the influence of age and intelligence differences upon the preferences studied herein and the remaining five school subjects.
2. To make a study of the analysis of the influence of mental age upon children's preferences for school subjects.
3. To make a follow up study on the same children in grade six to ascertain whether or not the same conditions are true at various stages of development of the same group of children.

BOSTON UNIVERSITY



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EXCERPTS FROM

THE HISTORY OF

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OF AMERICA

